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REPLY

The Examiner rejected claims 1-3, 12-13 under 35 U.S.C. §102(b) as being anticipated by Shieh et al.

The Examiner rejected claims 4-11, 14-16 under 35 U.S.C. §103(a) as being unpatentable over Shieh et al in view of Ueki. The Examiner rejected claims 17-22 under 35 U.S.C. §103(a) as being unpatentable over Shieh et al in view of Sopro et al.

In response to the Applicant's previous position that Shieh et al does not disclose an aperture layer as recited in claim 1, in the Final Office Action the Examiner merely indicated that the Examiner is interpreting implant 42 disclosed in Shieh et al to be an aperture layer formed of an insulating material that is substantially non-transparent for a specified wavelength range as recited in claim 1. (*Final Office Action, page 3, lines 1-6*) However, the disclosure of Shieh et al nowhere indicates that the implants 42 disclosed therein are or function as an aperture layer as recited in claim 1. Shieh et al merely discloses that "Implants 42 may optionally be formed in these remaining pairs of second mirror stack 37 to aid in preventing migration of defects and carriers". (*Shieh et al, column 4, lines 27-30*) Therefore, the implants 42 as disclosed in Shieh et al do not function as an aperture layer formed of an insulating material that is

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substantially non-transparent for a specified wave-length range and that has an aperture formed of conductive or optically transparent material with a first characteristic lateral size (d_{ox}). Additionally the implants 42 as disclosed in Shieh et al are not positioned and do not have a size so as to generate increased optical losses of the resonator with respect to higher order modes for a specified wavelength range, as recited in claim 1.

From a reading of Shieh et al as a whole, it is clear that the implants 42 do not have any impact on the optical losses of the resonator due to the fact that Shieh et al specifically teaches and advocates that "...to achieve a low resistance, the diametric size of the mesa is substantially larger than the optical mode of the VCSEL. In the preferred embodiment, the diametric size of the mesa is at least twice as large as the operating mode." (Shieh et al, column 4, lines 56-59, column 5, Line 1) Accordingly, as illustrated in Figs. 2 and 3 of Shieh et al, the ends of the implants 42 are well outside of the area of the mesa and therefore do not affect the optical losses of the resonator with respect to higher order modes as recited in claim 1. From a reading of Shieh et al as a whole and because the mesa has a diametric size substantially greater than the optical mode, the mesa cannot influence the optical mode or optical selectivity

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at all. Accordingly, Shieh et al has an optical mode that is determined or controlled by only one aperture, window 44.

The present invention as claimed establishes a relationship between three apertures, the aperture layer 112 having a first characteristic lateral size (d_{ox}), a second plurality of doped layers 114 or mesa having a second characteristic lateral size (d_m) that is defined in relation to the first characteristic lateral size, and the radiation window (d_p) 150. Accordingly in the present invention as recited in claim 1, the behavior of the laser is determined by the interplay of at least two different design or characteristic dimensions, the first characteristic lateral size (d_{ox}) and the second characteristic lateral size (d_m). Accordingly the present invention has dimensional flexibility in that a deviation of one parameter or dimension from a targeted value may be compensated for by another dimension so as not to compromise performance.

Additionally, there is no basis in the disclosure of Shieh et al to support the Examiner's interpretation of Shieh et al that the implants 42 are formed of an insulating material that is substantially non-transparent for a specified wavelength range. The implants 42, as disclosed in Shieh et al, are merely required to prevent migration of defects and carriers. Additionally, because the implants 42 are well outside of the range of the optical mode, they do not necessarily need to be made of a non-

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transparent material. While the implants 42 disclosed in Shieh et al are graphically depicted to look like an aperture, they do not function as an aperture and therefore is not an aperture layer as recited in claim 1. Therefore, claim 1 is not anticipated by Shieh et al.

From the Examiner's Final Action, it is unclear under what statutory basis the Examiner is rejecting method claims 23-28. The Examiner has merely indicated that "Method claims 23-28 are rejected for the same reasons applied above rejected Apparatus claims 1-22 and process margin (claim 29) is obvious in this art since this has been well established in industry to accommodate the individual error of the component in manufacturing process." (*Final Office Action, page 7, lines 13-16*) It is unclear how the rejections that apply to apparatus claims 1-22 also apply to methods claims 23-28.

Claim 23 recites a method claim that correlates at least two of the following characteristic dimensions of the vertical cavity surface emitting laser, a first characteristic lateral size representing a lateral extension of the aperture, a second characteristic lateral size representing a lateral extension of the second plurality of doped layers, a third characteristic lateral size representing a lateral size of a radiation output window, a vertical distance between the laser active region and the aperture layer, and a vertical distance between the aperture

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layer and the second plurality of doped layers. The Examiner has referenced no prior art that would render claim 23 unpatentable either in view of 35 USC §102 or 35 USC §103.

Similarly, it is difficult to determine the statutory basis or the rational in which the Examiner has rejected claims 30 and 31. Apparatus claim 30 recites a relationship between a first predetermined lateral dimension, second predetermined lateral dimension, and a predetermined thickness so as to maintain the desired output of the vertical cavity surface emitting laser that is not disclosed in any of the references cited by the Examiner.

Similarly method claim 31 recites method steps of measuring a lateral dimension and calculating an adjustment to a device dimension of subsequent layers so as to compensate for the deviation between the intended predetermined lateral dimension and the actual lateral dimension formed.

New claim 32 has been added. New claim 32 is similar to claim 1, but adds the limitation that the second characteristic lateral size (d_m) is adjusted to compensate for deviation of the first characteristic lateral size (d_{ox}) during the manufacturing process of the first characteristic lateral size (d_{ox}) wherein the difference results in the desired output of the vertical cavity surface emitting laser being maintained. Support for this recited feature is found on pages 3-4 of the application. New apparatus claim 32 adds this limitation in an effort to more

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clearly distinguish the present invention from the references cited by the Examiner. None of the references cited by the Examiner, and in particular Shieh et al, provides this ability to have more than one aperture that controls the optical mode of the device and the ability to adjust the operation of the device by modifying the relationship of the different apertures.

New method claim 33 has also been added that is similar to method claim 23, but adds the additional limitation that the step of correlating comprises adjusting the difference between at least two of the characteristic dimensions so as to compensate for deviations of at least one of the characteristic dimensions during the manufacturing process wherein the difference results in the desired output of the vertical cavity surface emitting laser being maintained. New method claim 33 has been added to introduce a limitation to further distinguish the present invention from the references cited by the Examiner, and in particular Shieh et al.

The present invention as claimed, and in particular as now claimed in newly introduced claims 32 and 33 recite limitations that are not found in any of the references cited by the Examiner, and in particular Shieh et al.

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Accordingly, it is respectfully requested that the Examiner reconsider the present application in view of this Amendment and Reply and indicated allowable subject matter.

Respectfully submitted,



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December 11, 2008